NML NEWS

Vol. X April 2003 No. 2

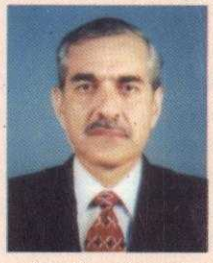
Research Council Meeting

Prof. S. P. Mehrotra, Director NML (Left) with Shri P. Parvathisem, Chairman RC

The 46th Meeting of the Research Council of the National Metallurgical Laboratory, Jamshedpur was held on March 28, 2003 at the laboratory. The meeting was attended by its Chairman, Shri P. Parvathisem, MD, Spex Engineering Pvt. Ltd. and members: Dr. G. Sundararajan, Director, International Advanced Research Centre for Power Metallurgy & New Materials, Hyderabad; Shri R.N. Parbat, Former MD, INDAL Hydro Extrusion Ltd.; Prof. T. Sundarajan, IIT, Chennai; Prof. D.D. Misra, Director, CMRI, Dhanbad; Dr. V. N. Mishra, Director, RRL, Bhubaneswar; Prof. S.P. Mehrotra, Director, NML; scientists and technical officers of the laboratory.

Prof. Mehrotra, Director, NML extended a warm welcome to the Chairman and members of the Council and gave a brief account of all the activities of the Laboratory during the period under review. He opined that all the performance indicators chosen for review revealed positive trends. He briefed on the latest status on CSIR network programmes, and commented that while NML was participating in seven such programmes along with other Laboratories/Agencies, NML itself was assigned a lead role in a newly approved

IIME Award to Prof. S. P. Mehrotra



The coveted Indian Institute of Mineral Engineers' (IIME) Mineral Beneficiation Award 2002 has been conferred on Prof. S.P. Mehrotra, Director, National Metallurgical Laboratory, Jamshedpur in a function held at Dinanath Mangeshkar Hall of Kala Academy Complex, Panaji, Goa on February 6, 2003. This National Award is given to him for his outstanding contribution to the developments in the field of mineral processing. It is worthwhile to mention here that, currently, Prof. S.P. Mehrotra is also the recipient of the Institution of Engineers' (India) - Distinguished Metallurgist Award 2002 and the Indian Institute of Metals' - SAIL Gold Medal 2002.

Professor Surya Pratap Mehrotra was born on 26th April, 1947 in Kashipur (Dist. Udham Singh Nagar), Uttaranchal. He did his B.Tech (1968), M.Tech (1970) and Ph.D (1973) in Metallurgical Engineering from IIT, Kanpur. He was

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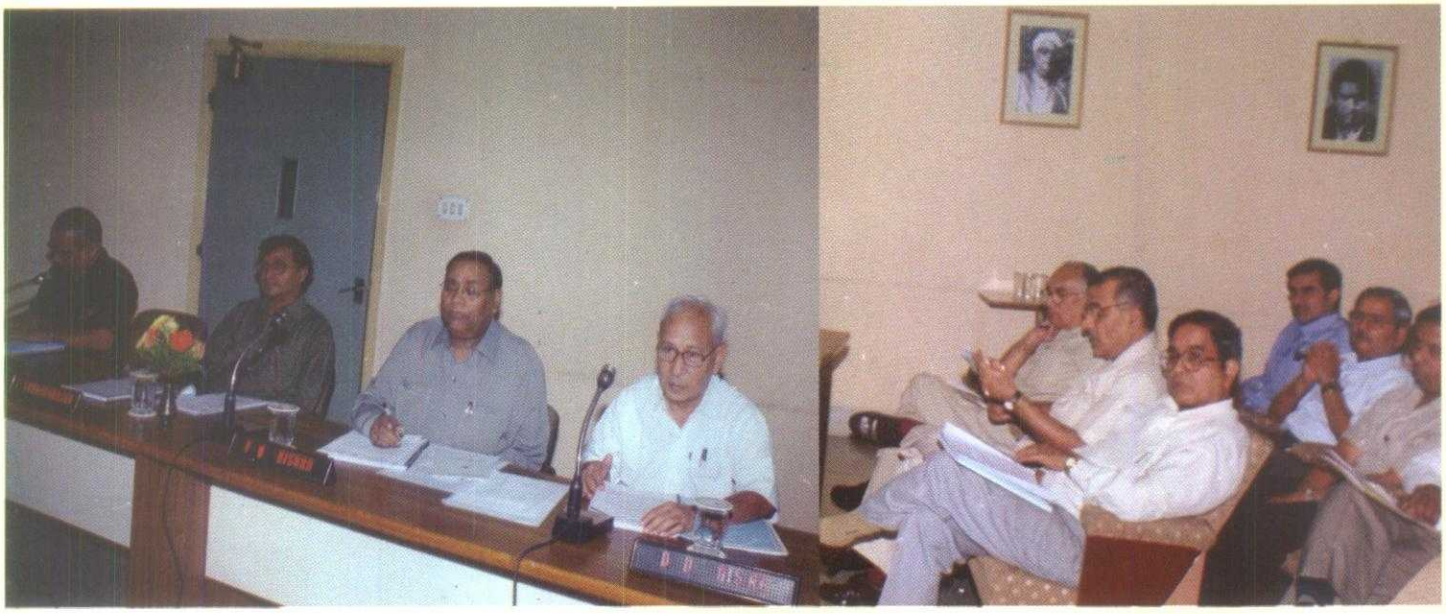


Research Council Meeting in progress

programme, namely, Technology of Engineering Criticality Analysis. The Laboratory was busy in working out details and would soon submit the same to CSIR.

Prof. Mehrotra informed the Council members about the new projects those were assigned during the period, highlighting the projects from Central Electricity Authority which aimed to (i) develop suitable materials to combat excessive abrasion wear in coal grinding, and, (2) develop silt erosion resistant material for turbines of hydro-generators. He also referred to the strategic studies/investigations relating to failure of MIG 21 aircraft sponsored by Indian Air Force/HAL, the results of which provided critical information for the maintenance of the fleet. Though, in terms of external cash flow, these projects might not fetch much, but the Laboratory's expertise and capability in this area was put to use for the cause of the Nation.

Prof. Mehrotra, further dwelt upon the Non Destructive Testing Centre (NDT) that was progressing through its detailed planning and procurement stage, which would function as an unique facility in the country for infrastructure/asset management. He also informed the Chairman and members of the Council that the Laboratory now became ISO 9001:2000 certified having undergone a rigorous upgradation audit during February, 2003.

The new standard lays much emphasis on measurable process improvements and business results and customer communication and satisfaction. The external auditors found that the Laboratory conformed to the requirements of all the above scores. The formal inclusion of Administration, Finance and Accounts into the Quality Management System augurs well for the future of Quality movement at NML.

Prof. Mehrotra gave details of the technologies transferred and agreements signed during the period, which was a sign of continued customer orientation and utilization of results. Also, several Scientists bagged awards, received honours - a process of peer recognition. On the front of external cash flow the Laboratory expected to achieve this year's target of about Rs. 550 lakhs, however this was much below the targets set by CSIR i.e. 50% of expenditure. To achieve this, all at NML have to put in lot of effort particularly in teams, which he observed in abundance in several ongoing activities.

The RC reviewed and noted the status of all ongoing and completed projects. This was followed by presentation of selected major ongoing and completed projects where interesting results from in house as well as externally financed projects were presented.

Maximising Blast Furnace Productivity with Indian Iron Ore

The status and progress made during the period of review was presented by Dr. R.P. Goel, Sr. Scientist. The project aims at development of a knowledge base for characterising the process dynamics of the iron making blast furnace to improve its productivity. The project comprises of 11 research activities and provision for necessary financial support for collaboration with experts from reputed institutions. The progress made in some of these research activities were discussed. The 2D-dynamic process model for the entire furnace was divided into several submodels as indicated below:

- A model was developed for burden distribution and validated with available literature data. A PC-version of the software (BDM-1.0) was installed at BSL for feedback from the plant personnel. NML and its collaborators proposed to collect the data required for the tuning of the model by the end of April 2003, subject to obtaining approval by the plant authority.

- Model for the flow behaviour of gas, solids and liquids developed by NML, while the coding for the gas and solids flow was completed, liquid flow model was under development.

- The code development for the freeze line model was completed. The validation of the model was in progress with the data obtained from the plants. The installation of a parallel processor was in progress in the

dedicated computational facility already set up at NML for modelling.

- A real time process simulator capable of predicting two-dimensional variations of process parameters to define the internal state of the reactor was to be developed with the expert help from IIT-Kharagpur.

Extraction of Magnesium from Indigenous Raw Materials

The progress of the project was presented by Dr. K.M. Godiwalla, Sr. Scientist. The objective and achievement of each campaign was highlighted together with their problems encountered. The results of three campaigns were presented. The magnesium metal produced was of about 90% purity. Difficulties experienced included (a) choking of the connector and condenser by a mixture of dust with magnesium (b) freezing of slag due to delay in tapping and (c) firing in the crucible due to CO-deposition.

Improved Granular Processing : Towards Energy Efficiency and Resource Conservation in Cement Manufacture

Dr. Rakesh Kumar, Project Leader, made the presentation. The focus of the project was on blended cement manufacture. The presentation included a brief background of the project, objective and scope, approach, work element and the progress made since the commencement of project in April 2002. The objectives of the project include - increased utilisation of slag and fly ash in blended cement manufacture and high performance cement. The basic approach to be used in the project was based on the recent development in the area of mechano-chemistry/mechano-chemical activation of solids. Results were presented on blended cement produced using inter and separate milling of cement constituents, namely, clinker and BF slag, in a laboratory attrition mill.

Fusion of rotary slide valve leading to Cat-I accidents of R-25 aero engines of MIG-21 aircrafts

Dr. S.R. Singh, Project leader presented the interesting results that observed during the study. Recently, there were three Cat-I accidents of MIG-21 aircrafts at Jodhpur, Ambala and Jaisalmer. The present investigation aimed at finding primary cause of fusion RSV and to suggest the remedial measure to IAF, so that recurrence of accidents due to RSV fusion could be avoided.

Processing of Titanium and Niobium/Titanium Steels for Automobile Applications

Dr. A.K. Vaish, Project Leader gave an overview of the results obtained so far. It was informed that the automobile industry was facing the challenge of reducing the weight of vehicles to achieve better fuel economy. As such hot and cold rolled steel make up about 50-60% weight of each vehicle and micro alloyed steels possess greatest weight reduction potential. In this regard the optimum process parameters in processing extra low carbon titanium and ultra low carbon niobium-titanium steels were highlighted and accordingly improved mechanical properties achieved during the investigation were presented with illustrations and photographs. It was stressed upon that (i) thermo-mechanically processed extra low carbon titanium steel was suitable for stamped wheel rims and wheel ribs and (ii) and thermo-mechanically processed, cold rolled and annealed (batch annealing as well as simulation for continuous annealing) ultra low carbon niobium-titanium steel sheets were extremely suitable for automobile body panels.

Self-assembly induced Ferri-Magnetic Behaviour of Super Paramagnetic Particles

Dr. (Ms) Suprabha Nayar made a presentation on the progress of the project. Recent reports highlighted the utility of monodispersed superpara-magnetic (SPM) iron oxide particles in biopolymeric matrices for a range of biomedical applications. Conventionally, sub-micron (100-300 nm) ferrimagnetic iron oxide particles precipitated from non-solvent or from supersaturated solution were dispersed into different synthetic media to form a composite film; role of macromolecules remained limited as a dispersant. Biomimetic synthesis is proving to be of help in the synthesis and self-assembly of several nanocrystalline inorganic systems. The investigators discussed the self-assembly of highly oriented array of SPM iron oxide particles that are biomimetically precipitated in a protein matrix under the influence of an external magnetic field.

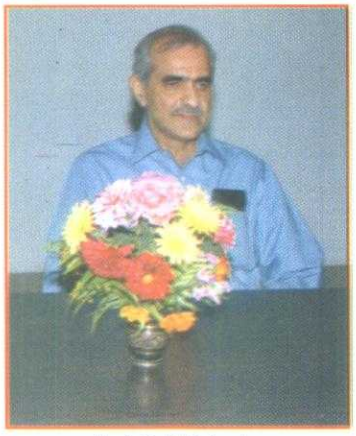
Extraction of Zinc from Zinc Concentrate and Regeneration of Oxidant-persulphate Salt during Electro-winning

The presentation was made by Dr. B. D. Pandey under the category of interesting results. While highlighting the problems of SO_2 pollution in the roasting step and need to convert SO_2 to sulphuric acid in the conventional zinc extraction roasting-leaching electrowinning, the development of an alternate hydro-metallurgical process involving leaching of zinc from sphalerite concentrate obtained from a Nepal deposit, by ammonium persulphate was dealt with. A recovery of 86% of Zn was reported at 60°C temperature when the amount of persulphate was in excess to the tune of 40% of the stoichiometric requirement for the oxidative leaching of zinc from spalerite concentrate. Although the zinc leach recovery was 95% from HZL concentrate, the lower recovery with the concentrate in this work was attributed to association of pyrite with zinc sulphide.

NDT CENTRE

NML with the help of Department of Science and Technology (DST), Govt. of India is going to launch its centre for infrastructure asset management by non-destructive evaluation techniques. The centre happens to be the first of its kind in the country and among the few in the developing world countries. The centre is coming up in collaboration with Indian Institute of Technology (IIT), Chennai. Initially the main job of the centre would be related with bridges, railway tracks and pressure vessels in petrochemical industries in the region. The centre would assess the integrity of infrastructure assets like bridges, power plants, roads, houses, dams, tunnels and communication network, and find out the remaining life and also how it could be improved.

Message from Director



Prof. S. P. Mehrotra

Dear Colleagues

I am glad to get back to you after a long lapse of time. Though I am in touch with you with updated information on matters of organisational interest during various formal and informal meets, through this medium, I once again wish to reach out to you and sustain the flow of information sharing.

We are now formally participating in seven task force projects specially funded by CSIR for inter-laboratory collaboration with a clear mandate, schedules and funds to achieve results on a faster mode. Since projects/tasks (listed below) assigned to us are based on our proven strengths, we need to deliver the results on schedule. Similarly, based on our strengths and capabilities in the area of material characterisation and development, we bagged a mega project from Central Electricity Authority, which when completed would contribute to the sustained development of nation's infrastructure in the area of power generation. Establishment of Non-destructive testing centre, on which we have been working for the past couple of years has also materialised under which we plan to develop capabilities for infrastructure asset management, encompassing, this national centre would enable us to contribute in the asset management of infrastructure as above through optimisation in their life cycles and also thwart predictable catastrophic failures.

We are now more than a half decade old Laboratory, which needs renewal and refurbishment. Recognising this fact, CSIR in its 10th Five-Year Plan has provided for special funds. Under the chairmanship of Dr. R.N. Ghosh, a team is working on the refurbishment plan of the Laboratory. We propose to submit this plan soon to CSIR and expect to receive sizeable funds to create state of the art infrastructure and environment to facilitate faster response to customer needs and satisfaction. You all know that NML is now a ISO 9001:2000 certified Laboratory having successfully undergone upgradation audit during February 2003.

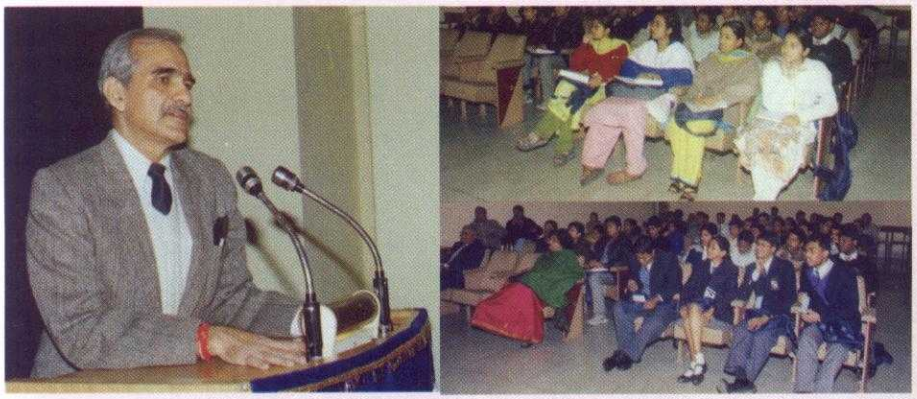
Unlike ISO 9001:94 version, the revised standard lays much emphasis on a Quality Management System whose bed rock is process approach and measurability of its outputs leading to sustainable development of the organisation's business and its customer's satisfaction. Hence, I seek total involvement of all my colleagues, irrespective of groups and grades to participate in the QMS whole heartedly, so that we are able to deliver results to our customers, be they private industry, PSUs, Government agencies, beyond their expectations resulting in Customer Delight, which is our commitment.

As part of CSIR Diamond Jubilee celebrations, we have planned a series of lectures by eminent personalities from metallurgy and material science. So far we had 3 of them by Shri B. Muthuraman, Managing Director, Tata Steel, Dr. P. Rodrigues, Chairman EAC, DRDO, Prof. K.L. Chopra, Consultant IIT Delhi, A few more by Prof. K.T. Jacob IISC and Shri S. Pandey, Managing Director, Bokaro Steel and others are being finalised. We plan to establish a book comprising all the lectures, which I am sure, will serve as broad vision for the pursuit of future plans and programmes at NML. During last quarter the following projects have been received from different sources. My congratulations to all the concerned project leaders.

(Source : Director's Desk, March 2003)

ISO 9001 : 2000 upgradation Audit in progress

CSIR Programme for Youth on Leadership in Science (CPYLS)



Prof. S. P. Mehrotra addressing the gatherings of CPYLS

In order to rejuvenate interest in science and technology as rewarding career options, the Council of Scientific and Industrial Research (CSIR) has brought the student fraternity under its programme on "Youth for Leadership in Science"

Nearly 42 best students of Bihar and Jharkhand schools participated in the two-day programme that teed off on the National Metallurgical Laboratory (NML) premises. The workshop included lectures on various aspects of science, technology, metals and minerals and lab visits at the NML.

In his inaugural address to the students, their teachers and guardians NML director Mehrotra said, "Today, science and technology are not considered to be glamorous or lucrative career options as management or computer software." While favouring the individual liberty of choosing a profession of one's choice, Mehrotra cautioned the students against falling prey to the glitter of other vocations without carefully analysing them and assessing one's aptitude.

"Remember! Einstein or Newton were not the world's richest men but they are still respected and revered for their revolutionary contributions," he said. "A good student can become a manager or even a software professional. But not everyone can become a good scientist. And this is where CSIR has steeped in to give a fillip to bright young Indian students," he maintained. Calling science and technology as "necessary tools" for economic and social development of society, the NML chief gave a glimpse of how exciting the world of science could be. Prof. S.P. Mehrotra underlined the growing need for students to study all options carefully before embarking on a career that would have lifelong repercussions.

Earlier, Dr. V. Rao spelling out the aims and objectives of this CSIR scheme said, "The goal is to attract meritorious school students towards science through a unique handholding experience. The scheme, covering students at secondary and tertiary levels, also aims at encouraging youth to discover science as a rewarding and fulfilling career."

CSIR has launched two new schemes-one providing support at senior and secondary school levels and the second at the undergraduate level. Under the first scheme, top 50 students appearing for Class X examinations under ICSE, CBSE or state boards are invited to visit the nearest CSIR laboratory for two days along with their parents/teachers at the CSIR's expense.

The second scheme targets students scoring over 90 percent marks in science subjects and desirous of pursuing science. They would be supported by CSIR till graduation and would be designated as "CSIR Student Associates". They will also be given the facility to work on a project in a CSIR laboratory during the vacations.

The inaugural address was followed by a talk on steel by Dr. R.N. Ghosh, the Sr. Dy. Director of NML and then followed by various sessions spread over two days where the invited students were exposed to the scope, theme and execution of materials research. These sessions contained lectures by NML scientists on various aspects of science and technology, lab visits and demonstration of several experiments which were enjoyed by the students.

Live demonstrations motivated the students

CSIR Diamond Jubilee National Workshop on

Remaining Life Assessment of Aged Components

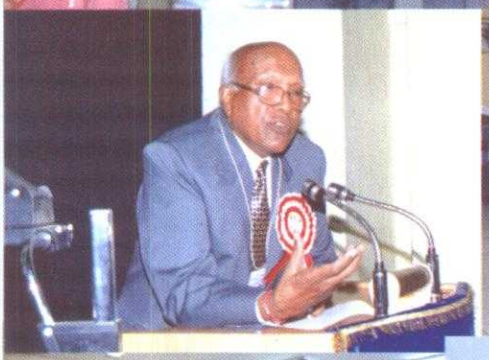
in Thermal Power Plants and Petrochemical Industries

A two day long National Workshop on "Remaining Life Assessment of Aged Components in Thermal Power Plants and Petrochemical Industries" (RLA 2003) was held at NML during January 8-9, 2003. The workshop was inaugurated by Sri B.M. Ritolia, Executive Director, National Fertiliser Limited, Vijaipur. Dr. Rajendra Kumar, former Director, RRL Bhopal was the Guest of Honour.

Prof. S.P. Mehrotra, Director, NML expressed deep satisfaction in welcoming the delegates to the seminar and apprised the audience of the various activities taken place in NML. As NML was already equipped with the state of the art equipment in the area of Remaining Life Assessment of aged components, he hoped that the workshop would result in fruitful proposals and collaboration with the visiting delegates.

Dr. Raghubir Singh, Sr. Dy. Director while introducing the guest of honour, the eminent Dr. Rajendra Kumar, spoke about the objective of the seminar and said that NML was lucky to have the biggest creep testing facility in Asia. This was set up with the assistance of UNDP and UNIDO.

Being a little nostalgic about his experience at NML, Dr. Rajendra Kumar stated that he was indeed happy to see the progress made by the laboratory. He claimed his deep association with NML since inception of the creep-testing laboratory in the 1970's. Expressing his views, Dr. Rajendra Kumar said that the scientists should expand their vision not just by finding out the failure of the components but also by thinking in terms of "Renovation for Life Extension". He expressed his view that neither metal nor plant load factor is responsible for plant failure but the malfunction and negligence results in the early failure of the components. He also pointed out that right at the planning stage of any project it is very important to decide on various materials that has to be used and then only can be prevented from the early failure of components.



Shri B.M. Ritolia spoke about his experiences and said that it is a tribute to the scientists working at NML who with their untiring efforts saved the nation of crores of rupees through RLA study conducted.

The inaugural function was followed by technical sessions. Over fifty delegates from different power plants, namely, hydroelectric, fertiliser and oil plants attended the workshop. Nearly twenty-five papers were presented in the two day workshop. The group leader from the

National Institute for Materials Science (NIMS) Japan, Dr. K. Kimura was a special invitee to the workshop. Dr. K. Kimura, author of five books and holder of doctorate degree from the Tokyo Institute

of Technology was greatly impressed by the facilities available at National Metallurgical Laboratory for carrying out the Remaining Life Assessment (RLA) for thermal, hydroelectric plants and oil refineries in India. He also observed that the number of RLA done in India far surpassed that in Japan.

Dr. Kimura made his presentation on "Creep Testing Facility and Research Projects in NIMS, Japan" on the first day of the workshop. He informed the audience that a Revolutionary Metallurgical Atlas and Creep Strain Data Sheet was still in the planning stages. Dr. Kimura continued by saying that the thermal power plants in Japan were over thirty years old. A few accidents, which occurred in the recent past, have highlighted the importance of carrying out the RLA. He further mentioned that NIMS and IGCAR, Kalpakkam were collaborating with each other and three Indian Scientists are presently working at NIMS.

Continuing Education Course on Metallurgy for Engineers

Inaugural Function : Prof. S. P. Mehrotra lighting the lamp

A three-day long workshop on continuing education course on Metallurgy for engineers (MFE-2003) was held at NML during 21-23 January, 2003. The aim of this course was to exchange experiences of people in the industry with that of people involved in metallurgical research. The course was jointly organised by NML and The Institute of Engineers (IE), Jamshedpur. The conference deliberated on problems faced by the people in industry and looked solutions for them.

The function started with a invocation presented by Dr. Ashok Ray in his melodious voice. The Chief Guest, Dr. O.N. Mohanty, Chief of R&D Scientific Services, Tata Steel, inaugurated the workshop, in a traditional manner with the lighting of the lamp.

Prof. S.P. Mehrotra, Director, NML, while welcoming the delegates gave a brief review about the activities of NML. He also mentioned the fact that last year the course was started by the former Director Prof. P. Ramachandra Rao and after seeing the overwhelming response the decision to continue this course was undertaken.

Shri D. P. Rathore Chairman, Institute of Engineers, Jamshedpur Local Chapter, in his speech enlightened the audience about the beginnings of the Institute. How it was started with the effort of a few persons and now it has grown to about 40,000 strong institute spread all over the world. He observed that engineers of diverse background would know more about metallurgy under the Continuing education Course (CEC) on Metallurgy.

Chief Guest Dr. O. N. Mohanty, while delivering his lecture on "An overview of metallurgy" gave few interesting examples from nature and how mankind has observed and used them for their own purposes. He related an incident that once during a programme "CAPART" he had to travel to a remote village in Orissa. Where he had the opportunity to observe artisans in working on a bronze article. As a metallurgists he knew that while working on bronze the temperature has to be maintained within a certain range to prevent the material from breaking. He was astonished to see that the artisan was working continuously; and had no means to measure the temperature. To satisfy his curiosity Dr. Mohanty continued to observe the artisans and was surprised to learn that while working the artisan was dipping his finger in water and from time to time was spraying the material with drops of water. A closer look revealed that the drops of water that the artisan sprinkled on the job at regular intervals helped him to measure the temperature through the rate at which the evaporation took place. Dr. Mohanty shared his thoughts with the audience and also tried to correlate various other examples from the environment with science. He mentioned that how the worms travels over a distance. While dragging its body a wave is created which makes it move over a unit distance. He related another incident that how a team of metallurgists including himself had tried to manufacture very thin glass under controlled laboratory conditions and had to face many difficulties whereas in India many artisans without any knowledge of thermodynamics could make thin glass by the knowledge handed down the ages.

Dr. Mohanty spoke about the practical problems that an engineer has to face and hoped that the knowledge gained by the engineers during the course would help them. He cited an example of construction of rebars. If one is broken and another is welded at that point what would be the stress created at that point of contact. He shared his views on various other aspects of phase transformations in steel.

Participants of MFE - 2003

CSIR Diamond Jubilee National Seminar on

Microalloyed Steel for Automotive Industries

A glimpse of the Seminar MSAI-2003

A two day long National Seminar on "Microalloyed Steel for Automotive Industries" (MSAI-2003) was organised at the National Metallurgical Laboratory (NML) Jamshedpur during January 30-31, 2003.

NML has played a leading role in developing varieties of steel for various industrial applications ever since its inception. It has specific facilities from steel making to forging, rolling, heat treatment, mechanical properties evaluation and metallographic characterisation. Presently, it is engaged in the development of special microalloyed steels suitable for various automotive applications. The seminar was jointly organised with the Indian Institute of Metals (IIM), Jamshedpur Chapter as a part of Diamond Jubilee Celebrations of Council of Scientific and Industrial Research (CSIR).

Automotive industries have grown very well all over the world during last one decade. Indian automotive industries too have taken a lead in this respect during last few years in view of the increasing domestic need as well as to meet export demand. Indian automotive industry is developing new strategies with respect to warranty as well as services to the customers. The world carmakers use about 45 million tonnes of steel to produce 35 million passenger cars annually. Steel an engineering material has tremendous potential for further improvement in all around properties and can indeedly be classified as an advanced material. Today the demand is for ultra light energy efficient and crash safe cars. Major steel producers in the world pro-actively formed a forum to develop the technologies for making ultra light steel body (ULSAB) cars in order to meet this demand. The seminar covered technical areas like: industry related problems; forged steel for auto components; low, extra low and ultra low carbon rolled steels; dual phase and TRIP steels; simulation and modelling and structure-property relationship.

The participants represented organisations like BE College, Howrah; IIT, Roorkee; IIT, Kharagpur; IIT, Kanpur; IT BHU, Varanasi; Tata Steel; Telco; Bhillai Steel Plant;

Bokaro Steel Plant; RDCIS SAIL, Ranchi; Alloy Steel Plant, Durgapur; National Institute of Technology, Adityapur; Hindustan Aeronautics, Bangalore; Essar Steels; Visvesewarya National Institute of Technology, Nagpur; Rourkela Steel Plant, RD CIS Limited, Pune and many more.

The Chief Guest Dr. Sanak Mishra, a towering personality in the field of micro-alloyed steel and Managing Director, Rourkela Steel Plant inaugurated the seminar lighting the lamp. Other two guests of Honour Sri M.L. Bapna, General Manager (Technical), TELCO, Jamshedpur and Shri H.M. Nerurkar, Vice President (Flat Products), Tata Steel also joined Dr. Mishra in lighting the lamp. Dr. R.N. Ghosh, Acting Director, NML, welcomed the delegates and narrated the achievements of NML in this area. Dr. A.K. Das, Chairman, Indian Institute of Metals, Jamshedpur Chapter and Chief, Flat Products, Tata Steel spoke about the need of such a seminar and its utility in long term for Indian Automotive Industries.

While delivering the keynote address as the Chief Guest, Dr. Sanak Mishra presented an overall development of micro-alloyed steel after 1960. He highlighted the Indian initiative in this field on the World Map. Mr. M.L. Bapna, stressed upon the special properties which are to be accomplished by micro-alloyed steels for their more vigorous and efficient usage in auto industry with a view to further reduce the weight of auto vehicle. Mr. H.M. Nerukar, stressed upon the better quality of flat products which are needed by auto industries by adopting special processing parameters. He also listed the achievements of Tata Steel in this direction by putting up Cold Rolling Mill. Dr. O.N. Mohanty, Chief, R&D and Scientific Services, Tata Steel, gave an excellent presentation covering almost all aspects of microalloyed steel and even the design of auto components and specific auto parts. He stressed upon the crash resistance and dent resistance characteristics of steel which are required by automotive bodies.

Dr. A.K.Vaish, Co-ordinator of this National Seminar apprised the gatherings of the facts that for the first time persons from steel industries, R&D Laboratories and from Academic circles have come on one platform and they described the entire gamut of microalloyed steel at NML.

A souvenir highlighting the special papers, popular articles and abstracts of technical papers was released on this occasion. Deputy Prime Minister Sri L.K. Advani in his message conveyed, 'R&D establishments of Council of Scientific and Industrial Research are doing commendable work. I am sure the seminar will provide an opportunity to exchange knowledge, experience and ideas in this field'. Dr. R.A. Mashelkar, the Director General of CSIR and secretary, DSIR, Govt. of India wrote, 'The development of micro-alloyed steels has undergone a revolutionary change in meeting the need for high strength steel used in critical auto components. This has led to considerably higher productivity at lower cost. Micro-alloyed steel has a tremendous potential as an advanced material. NML has done well in developing steel varieties for wide industrial applications and the organisation of this seminar is an important milestone in this regard. I am sure this seminar would provide an appropriate platform for sharing of experience, ideas and knowledge in this important area'. Prof. P. Ramachandra Rao, Vice Chancellor, Banaras Hindu University and former Director wrote 'The seminar, as a part of CSIR's Golden Jubilee celebration, will go a long way in exploring plausible improvements in micro-alloyed steel for superior automotive usage. On the occasion as the President of Indian Institute of Metals, I commend the relentless efforts of the organizers in making this event a success'. Likewise several goodwill messages have been received from Sri V.S. Jain, Chairman, Steel Authority of India, New Delhi, Sri B. Muthuraman, Managing Director, Tata Steel, Dr. T. Mukherjee, Dy. Managing Director, Tata Steel, Sri A.P. Arya, Vice President, Telco, Jamshedpur and Managing Director of Bhilai Steel Plant, Bokaro Steel Plant, Rourkela Steel Plant and many more leading personalities of the country. Dr. N.G. Goswami, Co co-ordinator has been responsible for publication of the souvenir which was quite informative and was of great demand.

The panel discussion was chaired by Prof. S.P. Mehrotra, Director, NML. The panel comprised of all six chairmen of six technical sessions. The main recommen-dations of the panel discussions are as follows : 1) Different facets of microalloyed steel-its production, processing and usage were discussed at length and the panel felt that Auto-Industries should communicate their intricate problems, which they come across during the design, fabrication and testing of autobody and its components, to steel producers, 2) Since special microalloyed steel is a fast emerging material for autobody and its components, any problem faced at any stage should be immediately tackled and possible solutions should be evolved on urgent basis, 3) Presently, it is being observed that many auto industries are hesitant to make use of high strength micro alloyed steels in real practice. It is therefore essential that auto industries must accept high strength microalloyed steels for auto components and auto bodies as is being used by Telco in making Tata-Sumo, Indica etc., 4) Apart from chemical composition, special attention should be given to modify, improve process parameters in various operations at each stage so as to bring significant improvement, 5) Auto industries have to bring a big change in their welding techniques while making use of microalloyed steels and 6) Auto industries as well as steel producers must evolve new standards based on the experience gained so far. These new standards will certainly prove a boon to both steel producers as well as automakers. The evolving of new changes must be incorporated accordingly from time to time.

Workshop on Promotion of Entrepreneurial Skills for Empowerment of Women

A National Workshop on "Promotion of Entrepreneurial Skills for Empowerment of Women" was held during 4-6 February, 2003. The objective of this workshop was to impart skills to women entrepreneurs. Scientists, representatives and people from different spheres shared their experience with the participants which also included visits to small scale units in Adityapur Industrial Belt and foothills of Dalma. The seminar exposed the participants towards procedures to set up small-scale industries, product development and marketing strategies, use of latest information and technologies etc. It also had a scope for demonstration on products of general attraction and utility. Working women and women entrepreneurs highly benefited from this workshop.

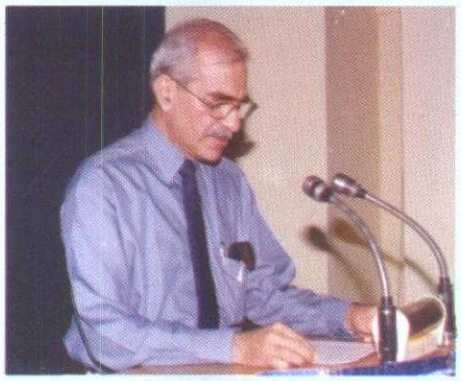
Workshop on Intellectual Property Assets in Business Development

(Top) : Inaugural Function of IPABD '03 : Dr. T. Mukherjee (L) and Prof. K. L. Chopra (R) lighting the lamp.
(Bottom) : Releasing the Souvenir by Dr. T. Mukherjee

The R&D Planning and Business Development Group of NML, as a part of CSIR Diamond Jubilee celebrations, organised a Workshop on "Intellectual Property Assets in Business Development (IPABD '03) during February 10-11, 2003 at NML, Jamshedpur.

The workshop set its objective and derived direction from the pioneering visions of both Honourable Minister of Science and Technology and Human Resource Development and Vice President, CSIR, Dr. Murli Manohar Joshi "The protection of intellectual property and its appropriate exploitation assumes crucial importance. It therefore becomes very important for us to ensure countrywide patent literacy, appropriate manpower planning in IPR, and judicious management of patent information. For this, we must not only involve those who innovate and those who exploit but also those members of the society who ultimately get affected." and Dr. R.A. Mashelkar, FRS, Director General, CSIR & Secretary Government of India, Department of Scientific & Industrial Research and the Patron of the Workshop IPABD'03 "Today, the generation of intellectual property, its capture, documentation, protection, evaluation and its exploitation has assumed a crucial importance. Indeed, a sea change is required in our ability to manage our countries valuable resources- our intellectual property"

The workshop, under the Chairmanship of Prof. S.P. Mehrotra Director NML, Jamshedpur was designed to address the issues related to Intellectual Property Rights and its applicability and compatibility with the scientific and technological innovation for their commercial exploitation for Scientist, Technologists and Managers in R&D institutions and industries interested in IPR protection for business development. The workshop theme accordingly was broadly covered into four sessions: IPR Basics, IP protection and policy, IP valuation and IP commercialisation. The faculty of IPABD has been drawn both from IPR professional and users was informed by Dr. Swatantra Prakash, Convenor IPABD'03 in his address about the IPABD'03.



Prof. S. P. Mehrotra

In his welcome address Prof. S.P. Mehrotra Director National Metallurgical Laboratory, Jamshedpur expressed concern over the Indian contribution to the pool of international patents, which is presently negligible. NML in its scientific pursuit developed many know-how and have acquired several intellectual property rights including a few international patents, he shared. He further envisioned that it is now imperative to enhance the value of this underline commercial products, goods and services to maximise the profit from research and innovation. Manpower planning of IPR protection in this context has to be handled on a priority basis, he explored.

Dr. T. Mukherjee, Dy. Managing Director in his inaugural address while eulogising the efforts of acquiring a large number of patents and intellectual properties emphasised the need for learning the art

Dr. T. Mukherjee

and science of marketing our knowledge and our technologies.

One can buy as many as many tangible assets as one likes. What really matters are the intangible assets. These are now normally 40-50% of value of the total assets of any progressive industrial organisation, he informed.

Prof. K.L. Chopra in his keynote address wondered whether acquiring large number of patents is right strategy. He compared the large number of patents filed in the country like USA, close to 300,000 or more with less than 1000

Prof. K. L. Chopra

patents filed in our country in a year. Of the total world patents, 98% are not utilised and there is a lot of money spent in filling it. So while there is a long way to go, there is a need to be aware of lot more things about IPR, Prof. Chopra invited in this context the people and the professionals evincing their keen interest in Research and innovation.

Nevertheless there is a need for more patents, but besides quantity, quality is also important, he emphasised, as excellence brings excellence. Knowledge is the currency of economy of the world. He further added that knowledge is our new God, Institutions like IITs are the temples, you and I the knowledge workers are the worshippers and innovations are our offerings. So let's all work towards innovations and more and more offerings to this God. This is the only way this country can enhance its Intellectual Property Rights and Assets.

The foregoing messages and the addresses were so very exuberating and thought provoking that they set the tone of the proceedings of the workshop. These pioneering views and visions would keep echoing in formulating the strategies of IP-savvy business systems in our respective organisations.

On this occasion, the IPABD'03 Souvenir was brought out, by having it released by the Chief Guest Dr. T. Mukherjee, Dy. Managing Director Tata Steel. It provides some background material on: IPR Basics and definitions; in the quest of IPR and the answers to the quests thereof. It presents additional reading material on Trips: Tips on Trips. A glossary for some IPR terms conveys the concepts and tools that are essential components for IPR. This glossary can serve as a reference for terms that may be new or whose meaning may be unclear.

About 55 delegates from R&D Laboratories, Industries, Academic Institutions and Business Houses participated in the workshop. Dr. T. Mukherjee, Dy. MD, Tata Steel; Prof. K.L. Chopra, Former Director, IIT, Kharagpur; Prof. S.P. Mehrotra, Director NML; Prof. S.K. Verma Director, Indian Law Institute; Shri N.K. Sharma, MD, NRDC; Shri R.K. Gupta, Head-URDP, CSIR; Dr. Amit Chatterjee, Tech. Adviser, Tata Steel; Ms. R.Hariharan, Kumaran and Sagar, Ms. S. Thawani, Tata Steel; Dr. (Ms) Rupa Mohanty, R.M. Associates; Shri M.K. Chakraborty, Davar & Co., Dr. Swatantra Prakash, Head RPBD NML delivered lectures on the several issues related to IP Management and reviewed IP Laws, conventions and treaties, IP protection and Policies, IP Valuation, IP commercialisation. A special session on IP Clinic was organised to demonstrate and demystify the IPRs related issues by leading IPRs Professionals.

The IPABD'03 comprises an interactive session for seeking answers to some of our curiosities and quests on IPR: IP clinic. The IP Clinic facilitated the group discussions and interaction with the IPABD expert panellists from the leading IPR practising and consulting organisations including NCL (CSIR) Pune, IPMD, (CSIR), NRDC and Kumaran & Sagar all from New Delhi; Tata Steel and NML (CSIR) both from Jamshedpur; Davar & Co. Kolkata and Law College BHU, Varanasi based on the points emanated in the group discussions and/ or during practising IPR at respective organisations. It, however, emerged that while IPR, WTO, TRIPS, GATT convention and treaties in Paris, Bern, USA and the like have been the buzzword in defining, formulating and organising the IP Policy, there is a need to create an awareness, inculcate and promote IP culture and exploit the value and potential of IPRs for their commercialisation.

Brainstorming Technical Session

Papers Published

- Cha ttoraj I., Tarafder M., Das S.K. and Tarafdar S. Hydrogen induced brittle crack growth in Cu-strengthened HSLA 100 Steels. *Material Science and Engineering A*, 339, 2003, pp. 136-149

- Das S., Ghosh A, Chatterjee S. and Rao P.R. The effect of cooling rate on structure and properties of a HSLA forging, *Scripta Materialia*, 48(1), 2003, pp 51-57

- Ghosh A, Das S. Chatterjee S. Mishra B and Rao P.R. Influence of thermomechanical processing and different post cooling techniques on structure and properties of an ultra low carbon Cu bearing HSLA forging, *Materials Science and Engineering* A , 348(1-2), 2003, pp 299-308

- Kumar S., Das S.K. and Daspoddar P.K. Thermomechanical behaviour of low cement castables derived from mullite aggregates synthesized from beach sand sillimanite, *Ceramics International*, 29(2), 2003, pp. 139-144

- Nayar S and Sinha A. Protein induced morphosynthesis of calcium carbonate, *Jr. of Materials Science Letters*, 22(3), 2003, pp. 167-170

- Raposo V., Vazquez and Mitra A. Torsion dependence of Giant Magneto impedance in Amorphous Wires, *Jr. of Magnetism and Magnetic Materials*, 254(NSI), 2003, pp. 179-181

- Ray A.K., Das S.K. and Pathak L.C. Synthesis of Silicon Carbide Mats using natural fibres, *Materials Letters*, 57(5-6), 2003, pp. 1120-1123

- Sahoo K.L., Das S.K. and Murthy B.S. Formation of novel microstructure in conventionally cast Al-Fe-V-Si alloys, *Material Science and Engineering A*, 355, 2003, pp. 193-200

- Sahoo K.L., Rao V. and Mitra A. Cystallisation kinetics in an amorphous Al-Ni-Mn-Fe alloys, *Jr. Materials Transactions*, 44(6), 2003,pp. 1-6

TECHNOLOGY TRANSFERRED

- Electrolytic Iron Power to M/s Vikas Saraf & Suresh Saraf and Saraf group of Companies
- Manufacturing of Pickling Inhibitor for descaling of steels in HCL acid solution to M/s Navdeep Chemicals Pvt. Ltd.
- Galvasalt-an improved production technology to M/s Ambica Industries, Kolkata

PATENTS GRANTED

- A process for making fluxed composite reduced iron pellets from the fines of iron rich material and carbonaceous materials (Appl. No. 1235DEL93, Dt. 28.02.2003)
- An improved process for the production of wear resistance ceramic using fly ash (Appl. No.1264DEL93, Dt.07.03.2003)
- A device useful for creep rupture testing (Appl. No.1468DEL93, Dt. 11.10.2002)

PATENTS FILED

- A process for recovery of fluoride chemicals from the leach liquor generated in the refining of low-grade molybdenite concentrate (Patent Appl. No.0797DEL2002, Dt.31.07.2002)
- A process for the recovery of chromium from chromite ore at low temperature (Patent Appl. No. 0800DEL2002, Dt.31.07.2002)
- A process for the preparation of nanosized acicular magnetic iron oxide in magnetic field by biomimetic route (Patent Appl.No.1094DEL2002, Dt.30.10.2002)
- A process for preparation of high temperature coating materials from fly ash (Patent Appl.No. 1228DEL2002, Dt.09.12.2002)
- A process for the production of lithium carbonate (Patent Appl. No. 0212DEL2003)
- An expansion cum vibration damping joint (Patent Appl. No. 068NF2001, Dt.27.03.2003)
- Process for the recovery of gold and silver from used refractory bricks (Patent Appl. No. US 01-04-2002)
- Process for the production of Al-Fe-V-Si alloys (Patent Appl. No. US 01-04-2002)
- Process for the production of neodymium-iron-boron permanent magnet alloy powder (Patent Appl. No. WO 08-04-2002)
- Process for the recovery of nickel from spent catalyst (Patent Appl. No. ML 13-03-2003)
- Process for preparing zirconium boride powder (Patent Appl. No. JP 14-03-2003)
- Process for preparing zirconium boride powder (Patent Appl. No. US 20-03-2003)
- Flux process for preparation and use thereof (Patent Appl. No. US 20-03-2003)
- Process for preparing zirconium boride powder (Patent Appl. No. EP 20-03-2003)
- Gallium recovery process (Patent Appl. No. US 20-03-2003)
- Process for the production of ceramic tiles (Patent Appl. No. KR 20-03-2003)
- Process for the production of ceramic tiles (Patent Appl. No. AU 25-03-2003)
- Sensing device for the non-destructive evaluation of steel structures and components (No. 1 International Patent, 20.03.2003, EP: 31.03.2003, JP)

MOUs Signed

- Electrolytic Iron Powder from sponge Iron Fines with M/s Saraf Organics Pvt. Ltd., Mumbai
- Technology support in supercomputing infrastructure based parallel processing strategy, computational fluid dynamics, numerical grid generation & scientific visualisation parallel computing from C-DAC with M/s. Centre for Development of Advanced Computing, Pune
- RLA and metallurgical failure analysis with M/s Test Metal Corporation, Kolkata
- Know-How for certifying Hardness Test Machines with M/s Fine manufacturing Industries, Miraj
- Development of real time simulator with Indian Institute of Technology, Kharagpur
- RLA Studies on the 15 MW TG set & auxiliaries at M/s Usha Beltron Ltd., Jamshedpur with M/s Associated Power Team (P) Ltd., Hyderabad
- Studies on crystallographic texture in reactor components with Bhabha Atomic Research Centre, Mumbai
- 'Galvasalt'- an improved process technology of galvaflux with M/s Ambica Industries, Hyderabad.
- Licensing and exploitation of developments with National Research Development Corporation, New Delhi.
- Development and utilisation of viable processes/technologies and expertise in the area of RLA and metallurgical failure analysis with M/s Utkal NDT Centre, Bhubaneshwar.

Personal Achievements

- Dr. Raghubir Singh, Head MTE Division, has been honoured with distinguished alumnus award of BIT Sindri
- Dr. (Ms.) Archana Agarwal, Scientist, NFP Division, has been elected as a Fellow of Institution of Chemists
- Shri Y.N. Tiwary, Tech. Officer, has been elected as an Associate of Institution of Chemists
- Shri M.M. Parmar, Tech. Asstt., IRM Division, has been awarded M.Tech from N.I.T. Jamshedpur
- Shri S.K. Sarkar, Tech. Asstt., HealthCare Centre has secured Associateship of Institution of Chemists through examination.

Talks Delivered

- "Two dimensional nano materials - A review", by Prof. K.L. Chopra, Former Director, IIT Kharagpur on 24th January, 2003
- "Carbon Accounting-A case study at Tata Steel" by Mr. R.P. Sharma, Head, Environment Management, Tata Steel, Jamshedpur on 3rd February, 2003
- "Controlling Microcrack Formation during Mechanical working of Al-SiCp MMC Castings" by Dr. I. Sinha, QHF, NML, Jamshedpur on 19th February, 2003
- "Interface Management in Al-Sicp Composite System" by Dr. B.C. Pai, Acting Director, RRL, Trivandrum on 3rd March, 2003
- "Application of Short Term Stress in Al-SiCp Composite System" by Mr. S.C. Bose, Dy. Manager, Metallurgy Department, Corporate R&D, BHEL, Hyderabad on 12th March, 2003.

Dr. B. C. Pai

Papers Presented

- *Remaining life assessment of service exposed reactor and distillation column materials of a petrochemical industry*, by J. Swaminathan, S. Sivaprasad, Y. N. Tiwary, P. K. Roy and R. Singh, presented (oral presentation) at the national seminar on Remaining Life Assessment of Aged Components in Thermal Power Plants and Petrochemical Industries (RLA-2003) held at NML Jamshedpur during 8-9 January, 2003.
- *Failure analysis and remaining life assessment of super heater tubes*, by Ashok Kumar Ray, presented in the Continuing Education on Metallurgy for Engineers at NML Jamshedpur, organised by NML Jamshedpur and Institution of Engineers, Jamshedpur Chapter during 21-23 January, 2003.
- *A simplified model for cold reduction and annealing of interstitial free steel sheets suitable for automotive applications*, by M.M.Humane, A.K.Vaish, M.R.Deshmukh et al., presented at the national seminar of microalloyed steel for automotive industries (MSAI-2003) held at Jamshedpur during 30-31 January, 2003.
- *A simplified model for thermochemical processing of low carbon and extra low carbon microalloyed steel suitable for automotive applications*, by M.M.Humane, A.K.Vaish, P.Karyakarte et al., presented at the national seminar of microalloyed steel for automotive industries (MSAI-2003) held at Jamshedpur during 30-31 January, 2003.
- *Production of very fine ZrB_2 powder by SHS Technique*, by A. K. Khanra, U.K. Singh, S. Paswan, L. C. Pathak, S. K. Mishra, M.M. Godkhindi, P. G. Mukunda, presented at the Annual ATM-29 of Powder Metallurgy Society held at Goa during 30-31 January, 2003.
- *Production of fine ZrB_2 powder and whisker by SHS Technique*, by A. K. Khanra, L. C. Pathak, S. K. Mishra, M.M. Godkhindi, P. G. Mukunda, presented at the annual ATM-29 of powder metallurgy Society held at Goa during 30-31 January, 2003.
- *Effect of thermal cycles on mechanical behaviour of a microalloyed steels*, by A. Seshukumar, S. Sivaprasad, V.R. Ranganath, presented at the National Seminar on Microalloyed Steel for Automotive Industries (MSAI-2003) held at NML Jamshedpur during 30-31 January, 2003
- *Effect of prestrain on fracture toughness of steel*, by S. Tarafder, S. Sivaprasad, V. R. Ranganath, K. K. Ray, presented at the National Seminar on Microalloyed Steel for Automotive Industries (MSAI-2003) held at NML Jamshedpur during 30-31 January, 2003.
- *Information technology for empowerment of women*, by Mita Tarafder, presented in the workshop on 'Promotion of Entrepreneurial skills for empowerment of women (ESEW-2003)' held at NML, Jamshedpur during 4-6 February, 2003.
- *Elimination of stubborn slimes using hydrocyclone*, by P. Bhattacharya, D. M. Chakrabarti, B. Banerjee and J.P. Srivastava, presented in the International Seminar on Mineral Processing Technology (MPT-2003) held at Goa during 6-8 February, 2003.
- *Studies on development of technology for beneficiation of low grade barite*, by R. Singh, B. Banerjee, K. K. Bhattacharya and J. P. Srivastava, presented in the International Seminar on Mineral Processing Technology (MPT-2003) held at Goa during 6-8 February, 2003.
- *Reduction of alumina in iron ore of Barsua Iron Ore*, by S.C.Maulik and K. K. Bhattacharya, presented in the International Seminar on Mineral Processing Technology (MPT-2003) held at Goa during 6-8 February, 2003.
- *Semi-commercial scale column flotation studies on the beneficiation of Goan iron ores*, by G. Bhaskar Raju, S. Prabhakar, S. Subba Rao, D.S. Rao and T.V. Vijayakumar, Y.S. Reddy and Auduth Timblo, presented in MPT-2003 held at IIME, Goa during 6-8 February, 2003
- *Beneficiation of a non-coking coal from Ranigunj, India*, by K. V. Rao, presented in the International Seminar on Processing of Gondwana Coals-Challenges and Solutions held at Kolkata during February, 2003.
- *Beneficiation of iron ore fines from Hospet, Karnataka*, by K.V.Rao, T.V.Vijaya Kumar, K. K. Bhattacharya & S.C.Maulik., presented in the International seminar on Mineral Processing Technology (MPT-2003) held at Goa during February 2003.
- *Phase-field approach - A paradigm shift in metallurgical solidification modelling*, by S.K.Das and K.M.Godiwalla, presented at the National symposium on Frontiers of Casting and Solidification Technology (FOCAST -2003) held at IIT, Kharagpur during 1-2 March, 2003.

DG, CSIR VISITS NML

Dr. R. A. Mashelkar, DG-CSIR and Secretary, DSIR visited the laboratory on 5th March 2003. *(Clockwise) : Prof. S. P. Mehrotra, Director, NML greeting Dr. R. A. Mashelkar, Director General, CSIR; Dr. Mashelkar addressing the Scientists/NML staff in the Auditorium; Dr. Mashelkar taking the stock of the progress in the Blast Furnace Modelling Programme; Dr. Mashelkar looking at the process flow sheet in the pilot plant; Being briefed about the progress of Magnesium Project.*

NML PARTICIPATES IN CONCEPT 2003

SISI, under Ministry of Small Scale Industry, Govt. of India and RIT Jamshedpur Alumni Association along with Adityapur Small Industries Association organised a Trade and Technology Fair - Concept 2003 at the RIT Campus from 10th to 12th January 2003. NML participated and showcased its technologies and technical competencies. This also helped to make the beneficiaries aware of the emerging market trends and developing a healthy vendor-vendee relationship, identification of suitable product development for SSI Units and possibilities of exploring new technology and market avenues. NML stall could attract thousands of visitors for the fruitful interactions and mutual benefits.

Foreign Deputation

Dr S.K.Das, Scientist, CAP Division, went for a short deputation to the Mathematical Modelling of Industrial Process (MMIP), CMIS, Common Wealth Scientific & Industrial Research Organisation (CSIRO), Sydney, Australia, during January, 2003. He also visited corporate R&D laboratories of BHP Steel and BHP-Billiton Central Research Laboratories. The deputation was under CSIR-CSIRO bilateral programme and collaborative research, to explore possibility of collaboration in the area of Mathematical modelling of metallurgical coke manufacturing process.

IIME Award

Contd. from Page 17

a Professor in the Department of Materials and Metallurgical Engineering and Dean of Faculty Affairs, Indian Institute of Technology (IIT), Kanpur before taking the present assignment.

Professor Mehrotra started his professional career in 1973 as a lecturer at IIT, Kanpur where he later elevated as Assistant Professor in 1975 and Professor in 1984.He has extensively travelled abroad on Academic assignments. He was a Visiting Professor at the University of British Columbia, Vancouver, Canada during 1979-81, Visiting Scientist during 1983-85. He was at the Pennsylvania State University at University Park during 1987 as a part of the Indo-US Science of Technology Initiative. He has visited several other Universities like University of California at Berkeley, Carnegie Mellan University, Columbia University, M.I.T., Purdue University, University of Pittsburg in U.S.A., McGill, Montreal and Toronto Universities in Canada, Imperial College and Sheffield University, in U.K. He has been to Lulea-Sweden, Maastrich-Netherlands, Florence-Italy and Montreal-Canada for participating in various International Conferences.

Professor Mehrotra is a renowned Process Metallurgist and one of the pioneers in this country to take up Mathematical Modeling and simulation of Mineral and Metallurgical processes. He has a wide spectrum of research interests ranging from Mineral Processing to Materials Science. Some of his pioneering research contributions include: Mathematical modeling of froth flotation Kinetics; Synthesis and optimal design of flotation circuits; Settling behaviour of particles in jigs; Studies on hydrodynamics in Pachuca tanks used for leaching of Uranium, Zinc and Gold ores; Mixing phenomena in gas agitated liquid baths; Studies on magnetohydrodynamics in Hall- Herault cells used in production of aluminium; Near net shape casting of metal and composite sheets using simple roll continuous sheet caster; Kinetics of gas solid reactions in fluidized bed reactors; Prediction of thermal behaviour to predict freezeline in the subhearth of an iron blast furnace and Prediction of surface energies in metal-ceramic systems. The uniqueness of his researches is that most of his modeling and simulation investigations have been accompanied by judiciously designed, rigorous experimental studies for data generation needed for validation of mathematical models.

As an outstanding teacher, Professor Mehrotra has designed and developed several new courses both at the graduate and undergraduate levels at IIT Kanpur and University of British Columbia, Vancouver, Canada. These include Mathematical Modeling of Metallurgical and Mineral Processes; Process Control in Metallurgy; Metallurgical Kinetics; Unit Operations and Processes in Extractive Metallurgy; Science and Technology of Non-Ferrous Metal Extraction; Process Plant Design for Metallurgical Operations. He has guided 3 Ph.Ds, about 35 M. Techs. and a large number of B.Tech. projects.

Professor Mehrotra has been very enthusiastic in organising Continuing Education activities as well. He has developed and offered several courses/ programmes, specifically designed for engineers/scientists working in industries, R & D organisations and academic institutions. Courses like Mathematical Modeling of Metallurgical Processes, Continuous Casting of Steel, Science and Technology of Mineral Processing and Transport Phenomena in Metallurgy have been repeatedly offered on request from industries.

While at IIT Kanpur, Professor Mehrotra has been involved in planning of education and directing research, and held several important administrative positions. He was the Co-ordinator of Quality Improvement Programme and Convenor, Continuing Education Programme (1988-90). He headed Metallurgical Engineering Department (1990-93) and Advanced Centre of Materials Science (1992-93). He has also been a member of Board of Governors of IIT Kanpur(1996 & 1997).

Professor Mehrotra has over 100 research publications in reputed National and International Journals and edited several Books and Monographs. He has organised and participated in a number of conferences/ seminars at national as well as international levels and delivered key note lectures and chaired technical sessions. He has received several awards and recognitions including: National Metallurgists' Day Best Metallurgist Award, Ministry of Steel and Mines, Govt. of India (1992); Maharashtra Govt. Award for Outstanding Research Contributions, Indian Society for Technical Education, New Delhi (1993); Fellow of Indian Institute of Metals (2000); Fellow of Indian National Academy of Engineering (2001).

Professor Mehrotra is a member of the Minerals, Metals and Materials Society (TMS) of AMIE, USA, life member of Indian Institute of Metals, Indian Society for Technical Education, Metal Research Society of India. He has also served as Vice President (1996-2000) and President (2000-02) of Indian Institute of Mineral Engineers. He is presently the member of Programme Advisory Committee in Engineering under Science and Engineering Research Council, DST, New Delhi; Member of Research Advisory Council of Jawaharlal Nehru Aluminium Research Development and Design Centre, Nagpur; Member of Editorial Advisory Board of Indian institute of Metals and member of review boards of several other national and international journals.

PULSE POLIO IMMUNISATION PROGRAMME

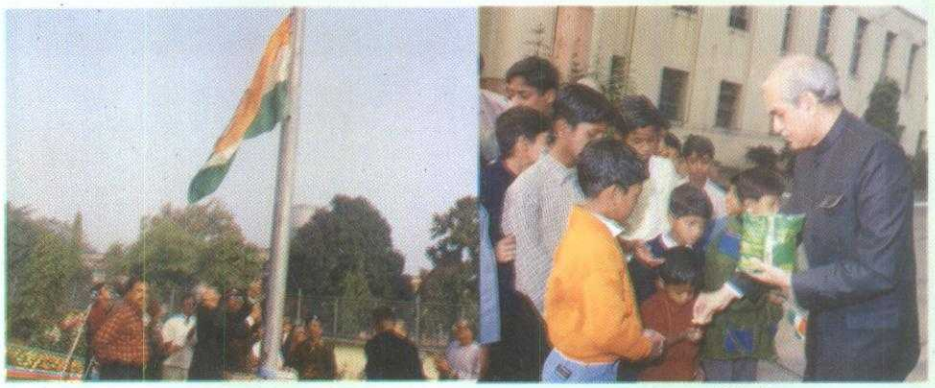
A two-day long pulse polio immunisation programme was organised by the laboratory and held at Agrico and Golmuri residential campuses during 10-11 February, 2003. Shri Rameshwar Dass, Controller of Administration and Shri Narendra Kumar, Administrative Officer took active part in this programme. There was a huge turnout of people with their children since early morning.

NML IN TECHFEST 2003

IIT, Mumbai organises Techfest R&D exhibition to showcase the innovation talent and enjoys the distinction of being the largest festival of this kind in India at a regular interval. Thus this kind of creating a common platform for exchange of knowledge among the participants from academia, research institutes and industries, is an unique endeavour by itself. On invitation, NML participated in the Techfest 2003 held at IIT, Mumbai during 31st January to 3rd February 2003. Few thousands visitors took advantage and interacted with NML scientists at the exhibition pavilion.

Republic Day Celebrations at NML

The Republic Day was celebrated with enthusiasm at NML premises. Prof. S.P. Mehrotra, Director hoisted the National Flag in presence of a large gathering of staff members. To mark the occasion a colourful programme of music and dance was organised in the NML Auditorioum. Earlier, Mrs. Archana Mehrotra hoisted the National Flag at the NML Flats, Agrico as well as NML Colony, Tuiladungri and distributed sweets to children.



Wishing a Happy Retired Life

Mr. H.C. Upadhyay, Gr.II(3); Mr. B. Machua, Gr.II(4); Mr. Dharamraj Singh, Gr.II(4); Mr. Parasnath, Gr.IV(5), P.S. Balakrishnan, Asst.(G); Mr. D.D. Singh, Gr.II(5); Mr. S.P. Sharma, Gr.II(4); Mr. S.K. Pramanik, Gr.II(4); Mr. Goverdhan Rajak, Gr.II(4); Mr. P.N. Pathak, Gr.IV(4); Mr. Ashesh Banerjee,Gr.II(4); Mr. S.K. Ghosh, Gr.II(4); Mr. Satrughan Singh,TO(C); Mr. A.Soren, Gr.II(4); Mr. G.V.R. Iyer, Gr.IV(4); Mr. Sashi Jha, Gr.I (4)

Welcome at NML

Mr. Rameswar Das, COA; Mr. M. Dulip Kumar, SPO; Mr. Ajay Kumar Thakur , Asst. (G); Mr. Amit Kumar Das, Jr Steno (Hindi Cell); Mr. A.D. Banerjee; Mr. Rajesh Nayak and Mr. B. Shankar Rao (Watchman).

EDITED & PRODUCED BY Dr. N.G. GOSWAMI, HEAD, INFORMATION MANAGEMENT AND BUSINESS PROMOTION UNIT, NML
PUBLISHED BY DIRECTOR, NATIONAL METALLURGICAL LABORATORY, JAMSHEDPUR - 831 007
Phone : 91+ (0657) 2271715, 2271709-14, E-mail : director@nmlindia.org, Website : www.nmlindia.org
Printed at Steel City Press, Jamshedpur - 831 001, Ph.: 2439861